IN THE CLAIMS

1. (Previously Withdrawn) A flame retardant polymer composition comprising:

a polymer material; and

a polycondensation product of a plurality of monomers of an at least partially hydrolyzed, phosphinate-chelated metal oxide precursor.

2. (Previously Withdrawn) The flame retardant polymer composition of claim 1, wherein said polymer material comprises at least one of an alkyd resin, a vinyl ester resin, a polyurethane resin, an epoxy resin, a phenol resin, an urea-aldehyde resin, a polyvinyl aromatic, a maleimide resin, a polyvinyl halide resin, a polyolefin, a polyorganosiloxane, an amino resin, a polyamide, a polyimide, a polyetherimide, a polyphenylene sulfide resin, an aromatic polysulfone, a polyamideimide, a polyesterimide, a polyesteramideimide, a polyvinyl acetal, a fluorinated polymer, and a polycarbonate.

3. (Previously Withdrawn) The flame retardant polymer composition of claim 1, wherein each of said plurality of monomers of said at least partially hydrolyzed, phosphinate-chelated metal oxide precursor comprises at least one of a transition metal, an alkaline earth metal and a metallic element selected from the group comprising Groups 3A, 4A and 5A of the periodic table of elements.

4. (Previously Withdrawn) The flame retardant polymer composition of claim 3, wherein each of said plurality of monomers of said at least partially hydrolyzed, phosphinate-chelated metal oxide precursor comprises at least one of aluminum, antimony, bismuth, calcium, chromium, magnesium, tin, titanium, zinc, and zirconium.

5. (Previously Withdrawn) The flame retardant polymer composition of claim 1, further comprising at least one of a fire retardant additive, a blowing agent, a fibrous reinforcing material, a pigment, a mold release agent, a thermoplastic polymeric material, an elastomeric polymeric material, a shrink control agent, a wetting agent, an antifoam agent, a surface treatment agent, and a thickener.

6. (Previously Withdrawn) The flame retardant polymer composition of claim 1, wherein said polycondensation product comprises nano-clusters of said monomers of said at least partially hydrolyzed phosphinate-chelated metal oxide precursor, said nano-clusters having an average diameter of about less than 100 nm.

7. (Previously Withdrawn) The flame retardant polymer composition of claim 1, wherein each of said plurality of monomers of said at least partially hydrolyzed, phosphinate-chelated metal oxide precursor comprises an anion having the formula:

wherein R_1 and R_2 are selected from the group of moieties comprising an alkyl, an aryl, an alkoxy and an aryloxy moiety.

8. (Previously Withdrawn) The flame retardant polymer composition of claim 1, wherein each of said plurality of monomers of said at least partially hydrolyzed, phosphinate-chelated metal oxide precursor comprises a phosphinate anion derived from phosphinic acid.

9. (Previously Withdrawn) The flame retardant polymer composition of claim 1, wherein each of said plurality of monomers of said at least partially hydrolyzed, phosphinate-chelated metal oxide precursor comprises a diphenylphosphinate anion.

10. (Previously Withdrawn) The flame retardant polymer composition of claim 1, wherein said polycondensation product is present in the flame retardant polymer composition in an amount in the range of about 0.1% to about 50.0% by weight of flame retardant polymer composition.

11. (Canceled) A process for making a phosphorous-containing metal oxide sol comprising the steps of:

contacting a metal oxide precursor with a source of organophosphinate anions to form a phosphinate-chelated metal oxide precursor;

at least partially hydrolyzing said phosphinate-chelated metal oxide precursor to form at least partially hydrolyzed phosphinate-chelated metal oxide precursor monomers; and

permitting said at least partially hydrolyzed, phosphinate-chelated metal oxide precursor monomers to polycondense to form a phosphorous-containing metal oxide sol comprising a liquid and a polycondensation product of said at least partially hydrolyzed phosphinate-chelated metal oxide precursor monomers.

12. (Canceled) The process for making a phosphorous-containing metal oxide sol of claim 11, the process further comprising the step of contacting said phosphinate-chelated metal oxide precursor with a polymer material before the step of at least partially hydrolyzing said phosphinate-chelated metal oxide precursor.

13. (Canceled) The process for making a phosphorous-containing metal oxide sol of claim 11, further comprising the step of contacting said phosphorous-containing metal oxide sol with a polymer material.

14. (Canceled) The process for making a phosphorous-containing metal oxide sol of claim 11, wherein the step of contacting a metal oxide precursor with a source of organophosphinate anions comprises selecting said metal oxide precursor from the group comprising at least one of a transition metal, an alkaline earth metal and a metallic element selected from Groups 3A, 4A and 5A of the periodic table of elements.

15. (Canceled) The process for making a phosphorous-containing metal oxide sol of claim 14, wherein said step of selecting said metal oxide precursor comprises selecting said metal oxide precursor from the group of metal oxide precursors comprising at least one of aluminum, antimony, bismuth, calcium, chromium, magnesium, tin, titanium, zinc, and zirconium.

16. (Canceled) The process for making a phosphorous-containing metal oxide sol of claim 11, wherein the step of contacting a metal oxide precursor with a source of organophosphinate anions comprises contacting said metal oxide precursor with a source of anions having the formula:

where R_1 and R_2 are selected from the group of moieties comprising an alkyl, an aryl, an alkoxy and an aryloxy moiety.

17. (Canceled) The process for making a phosphorous-containing metal oxide sol of claim 16, wherein the step of contacting a metal oxide precursor with a source of organophosphinate anions comprises contacting said metal oxide precursor with a phosphinic acid.

18. (Canceled) The process for making a phosphorous-containing metal oxide sol of claim 17, wherein the step of contacting said metal oxide precursor with a phosphinic acid comprises contacting said metal oxide precursor with diphenylphosphinic acid.

19. (Canceled) The process for making a phosphorous-containing metal oxide sol of claim 11, wherein the step of at least partially hydrolyzing said phosphinate-chelated metal oxide precursor comprises the step of contacting said phosphinate-chelated metal oxide with a hydrolyzing agent.

20. (Canceled) The process for making a phosphorous-containing metal oxide sol of claim 19, wherein the step of at least partially hydrolyzing said phosphinate-chelated metal oxide precursor comprises the step of contacting said phosphinate-chelated metal oxide with de-ionized water.

21. (Canceled) The process for making a phosphorous-containing metal oxide sol of claim 11, further comprising the step of removing said liquid from said phosphorous-containing metal oxide sol.

22. (Amended) A process for making a flame retardant polymer composition comprising the steps of:

contacting a metal oxide precursor with a source of organophosphinate anions to form a phosphinate-chelated metal oxide precursor;

at least partially hydrolyzing said phosphinate-chelated metal oxide precursor to form at least partially hydrolyzed phosphinate-chelated metal oxide precursor monomers;

permitting said at least partially hydrolyzed, phosphinate-chelated metal oxide precursor monomers to polycondense to form a phosphorous-containing metal oxide sol, the sol comprising a liquid phase and a dispersed phase, the dispersed phase comprising nano-clusters having an average size of less than about 1000 nm, the nano-clusters comprising phosphorous-containing metal oxide;

contacting at least the dispersed phase of said phosphorous-containing metal oxide sol with a polymer material to form a mixture; and

~~at least one of polymerizing and solidifying said mixture~~ producing a polymer composition, with phosphorous dispersed therein and having flame retardant properties, from the mixture.

23. (Canceled) The process for making a flame retardant polymer composition of claim 22, wherein said phosphorous-containing metal oxide sol comprises a liquid and a polycondensation product of said at least partially hydrolyzed phosphinate-chelated metal oxide precursor monomers, and the process further comprises the step of removing said liquid before the step of contacting said phosphorous-containing metal oxide sol with a polymer material.

24. (Canceled) The process for making a flame retardant polymer composition of claim 22, wherein said phosphorous-containing metal oxide sol comprises a liquid and a polycondensation product of said at least partially hydrolyzed phosphinate-chelated metal oxide precursor monomers, and the process further comprises the step of removing said liquid after the step of contacting said phosphorous-containing metal oxide sol with a polymer material.

25. (Canceled) The process for making a flame retardant polymer composition of claim 22, wherein said phosphorous-containing metal oxide sol comprises a liquid and a polycondensation product of said at least partially hydrolyzed phosphinate-chelated metal oxide precursor monomers, and the process further comprises the step of removing said liquid after the step of at least one of polymerizing and solidifying said mixture.

26. (Amended) The process for making a flame retardant polymer composition of claim 22, wherein the step of contacting a metal oxide precursor with a source of organophosphinate anions comprises the step of selecting said metal oxide precursor from the group ~~comprising at least one~~ consisting of a transition metal, an alkaline earth metal and a metallic element selected from Groups 3A, 4A and 5A of the periodic table of elements.

27. (Amended) The process for making a flame retardant polymer composition of claim 26, wherein the step of selecting said metal oxide precursor comprises selecting said metal oxide precursor from the group of metal oxide precursors ~~comprising at least one~~ consisting of aluminum, antimony, bismuth, calcium, chromium, magnesium, tin, titanium, zinc and zirconium.

28. (Amended) The process for making a flame retardant polymer composition of claim 22, the process further comprising, before the step of producing a polymer composition ~~at least one of polymerizing and solidifying said mixture~~, the step of ~~contacting~~ adding to said mixture ~~with~~ at least one ingredient selected from the group ~~comprising~~ consisting of a flame retardant additive, a blowing agent, a fibrous reinforcing material, a pigment, a mold release agent, a thermoplastic polymeric material, an elastomeric polymeric material, a shrink control agent, a wetting agent, an antifoam agent, a surface treatment agent, and a thickener.

29. (Amended) The process for making a flame retardant polymer composition of claim 22, the process further comprising the step of ~~contacting~~ adding to said phosphorous-containing metal oxide sol ~~with~~ at least one ingredient selected from the group ~~comprising~~ consisting of a flame retardant additive, a blowing agent, a fibrous reinforcing material, a pigment, a mold release agent, a thermoplastic polymeric material, an elastomeric polymeric material, a shrink control agent, a wetting agent, an antifoam agent, a surface treatment agent, and a thickener.

30. (Amended) The process for making a flame retardant polymer composition of claim 22, wherein the step of contacting a metal oxide precursor with a source of organophosphinate anions comprises selecting said source of organophosphinate anions from the group consisting of materials that derive anions having the formula:

wherein R_1 and R_2 are selected from the group of moieties comprising an alkyl, an aryl, an alkoxy and an aryloxy moiety.

31. (Amended) The process for making a flame retardant polymer composition of claim 22, wherein the step of contacting a metal oxide precursor with a source of organophosphinate anions comprises selecting said source of organophosphinate anions from the group ~~comprising~~ consisting of phosphinic acids.

32. (Original) The process for making a flame retardant polymer composition of claim 22, wherein the step of contacting a metal oxide precursor with a source of organophosphinate anions comprises contacting said metal oxide precursor with diphenylphosphinic acid.

33. (Original) The process for making a flame retardant polymer composition of claim 22, wherein the step of at least partially hydrolyzing said phosphinate-chelated metal oxide precursor comprises the step of contacting said phosphinate-chelated metal oxide precursor with a hydrolyzing agent.

34. (Original) The process for making a flame retardant polymer composition of claim 33, wherein the step of contacting said phosphinate-chelated metal oxide precursor with a hydrolyzing agent comprises contacting said phosphinate-chelated metal oxide precursor with de-ionized water.

35. (Amended) The process for making a flame retardant polymer composition of claim 22, wherein the step of contacting at least the dispersed phase of said phosphorous-containing metal oxide sol with a polymer material comprises contacting said phosphorous-containing metal oxide sol with a polymer material selected from the group ~~comprising at least one~~ consisting of an alkyd resin, a vinyl ester resin, a polyurethane resin, an epoxy resin, a phenol resin, an urea-aldehyde resin, a polyvinyl aromatic, a maleimide resin, a polyvinyl halide resin, a polyolefin, a polyorganosiloxane, an amino resin, a polyamide, a polyimide, a polyetherimide, a polyphenylene sulfide resin, an aromatic polysulfone, a polyamideimide, a polyesterimide, a polyesteramideimide, a polyvinyl acetal, a fluorinated polymer, and a polycarbonate.

36. (Original) The process for making a flame retardant polymer composition of claim 22, further comprising the step of contacting said metal oxide precursor with a solvent before the step of contacting said metal oxide precursor with a source of organophosphinate anions.

37. (Amended) The process for making a flame retardant polymer composition of claim 36, wherein the step of contacting said metal oxide precursor with a solvent comprises the step of selecting said solvent from the group ~~comprising~~ consisting of water, alcohols, and glycols.

38. (Amended) A process for making a flame retardant polymer composition, the process comprising:

contacting a metal oxide precursor with a source of organophosphinate anions to form a phosphinate-chelated metal oxide precursor;

contacting said phosphinate-chelated metal oxide precursor with a polymer material;

at least partially hydrolyzing said phosphinate-chelated metal oxide precursor to form at least partially hydrolyzed phosphinate-chelated metal oxide precursor monomers;

permitting said at least partially hydrolyzed, phosphinate-chelated metal oxide precursor monomers to polycondense to form a phosphorous-containing metal oxide sol, the sol comprising a dispersed phase of nano-clusters having an average size of less than about 1000 nm ; and

~~at least one of polymerizing and solidifying said polymer material.~~ producing a flame retardant polymer composition comprising from about 0.1 to about 50 wt% phosphorous-containing metal oxide dispersed therein.

39. (Amended) The process for making a flame retardant polymer composition of claim 38, wherein said phosphorous-containing metal oxide sol comprises a liquid and a polycondensation product of said at least partially hydrolyzed phosphinate-chelated metal oxide precursor monomers, and the process further comprises the step of removing said liquid before the step of producing. ~~at least one of polymerizing and solidifying said polymer material~~.

40. (Amended) The process for making a flame retardant polymer composition of claim 38, wherein said phosphorous-containing metal oxide sol comprises a liquid and a polycondensation product of said at least partially hydrolyzed phosphinate-chelated metal oxide precursor monomers, and the process further comprises the step of removing said liquid after the step of producing. ~~at least one of polymerizing and solidifying said polymer material~~.

41. (Amended) The process for making a flame retardant polymer composition of claim 38, wherein the step of contacting a metal oxide precursor with a source of organophosphinate anions comprises the step of selecting said metal oxide precursor from the group of metal oxide precursors ~~comprising at least one~~ consisting of a transition metal, an alkaline earth metal and a metallic element selected from Groups 3A, 4A and 5A of the periodic table of elements.

42. (Amended) The process for making a flame retardant polymer composition of claim 41, wherein the step of selecting said metal oxide precursor comprises selecting said metal oxide precursor from the group of metal oxide precursors ~~comprising at least one~~ consisting of aluminum, antimony, bismuth, calcium, chromium, magnesium, tin, titanium, zinc and zirconium.

43. (Amended) The process for making a flame retardant polymer composition of claim 38, the process further comprising the step of adding to ~~contacting~~ said phosphorous-containing metal oxide sol ~~with at~~ least one ingredient selected from the group ~~comprising~~ consisting of a flame retardant additive, a blowing agent, a fibrous reinforcing material, a pigment, a mold release agent, a thermoplastic polymeric material, an elastomeric polymeric material, a shrink control agent, a wetting agent, an antifoam agent, a surface treatment agent, and a thickener.

44. (Amended) The process for making a flame retardant polymer composition of claim 38, wherein the step of contacting a metal oxide precursor with a source of organophosphinic anions comprises the step of selecting said source of organophosphinic anions from the group consisting of materials that derive anions having the formula:

wherein R_1 and R_2 are selected from the group of moieties ~~comprising~~ consisting of an alkyl, an aryl, an alkoxy and an aryloxy moiety.

45. (Original) The process for making a flame retardant polymer composition of claim 38, wherein the step of contacting a metal oxide precursor with a source of organophosphinate anions comprises the step of selecting said source of organophosphinate anions from the group comprising phosphinic acids.

46. (Original) The process for making a flame retardant polymer composition of claim 45, wherein the step of contacting a metal oxide precursor with a source of organophosphinate anions comprises contacting said metal oxide precursor with diphenylphosphinic acid.

47. (Original) The process for making a flame retardant polymer composition of claim 38, wherein the step of at least partially hydrolyzing said phosphinate-chelated metal oxide precursor comprises the step of contacting said phosphinate-chelated metal oxide precursor with a hydrolyzing agent.

48. (Original) The process for making a flame retardant polymer composition of claim 47, wherein the step of contacting said phosphinate-chelated metal oxide precursor with a hydrolyzing agent comprises contacting said phosphinate-chelated metal oxide precursor with de-ionized water.

49. (Amended) The process for making a flame retardant polymer composition of claim 38, wherein the step of contacting said phosphinate-chelated metal oxide precursor with a polymer material comprises contacting said phosphinate-chelated metal oxide precursor with a polymer material selected from the group ~~comprising at least one~~ consisting of an alkyd resin, a vinyl ester resin, a polyurethane resin, an epoxy resin, a phenol resin, an urea-aldehyde resin, a polyvinyl aromatic, a maleimide resin, a polyvinyl halide resin, a polyolefin, a polyorganosiloxane, an amino resin, a polyamide, a polyimide, a polyetherimide, a polyphenylene sulfide resin, an aromatic polysulfone, a polyamideimide, a polyesterimide, a polyesteramideimide, a polyvinyl acetal, a fluorinated polymer, and a polycarbonate.

50. (Original) The process for making a flame retardant polymer composition of claim 38, further comprising the step of contacting said metal oxide precursor with a solvent before the step of contacting said metal oxide precursor with a source of organophosphinate anions.

51. (Amended) The process for making a flame retardant polymer composition of claim 50, wherein the step of contacting said metal oxide precursor with a solvent comprises the step of selecting said solvent from the group ~~comprising~~ consisting of water, alcohols, and glycols.

52. (New) A process for making a flame retardant polymer composition, the process comprising:

contacting a metal oxide precursor with a source of organophosphinate anions to form a phosphinate-chelated metal oxide precursor;

contacting said phosphinate-chelated metal oxide precursor with a polymer material;

at least partially hydrolyzing said phosphinate-chelated metal oxide precursor to form at least partially hydrolyzed phosphinate-chelated metal oxide precursor monomers;

permitting said at least partially hydrolyzed, phosphinate-chelated metal oxide precursor monomers to polycondense to form a phosphorous-containing metal oxide sol; and

producing a polymer composition comprising a concentration of about 0.5 to about 30 wt% phosphorous-containing metal oxide, the phosphorous-containing metal oxide dispersed throughout the polymer composition in nano-clusters having an average size less than about 1000 nm.

53. (New) The process for making a flame retardant polymer composition of Claim 52, wherein the nano-cluster average size is less than about 100 nm.

54. (New) The process for making a flame retardant polymer composition of Claim 52, wherein the concentration of phosphorous-containing metal oxide is from about 0.1 to about 10 wt%.

55. (New) The process for making a flame retardant polymer composition of Claim 53, wherein the concentration of phosphorous-containing metal oxide is from about 0.1 to about 10 wt%.

56. (New) A process for making a flame retardant polymer composition comprising the steps of:

contacting a metal oxide precursor with a source of organophosphinate anions to form a phosphinate-chelated metal oxide precursor;

at least partially hydrolyzing said phosphinate-chelated metal oxide precursor to form at least partially hydrolyzed phosphinate-chelated metal oxide precursor monomers;

permitting said at least partially hydrolyzed, phosphinate-chelated metal oxide precursor monomers to polycondense to form a phosphorous-containing metal oxide sol;

contacting at least a dispersed phase of said phosphorous-containing metal oxide sol with a polymer material to form a mixture; and

producing a polymer comprising from about 0.5 to about 30 wt% phosphorous-containing metal oxide dispersed therein, the phosphorous-containing metal oxide in nano-clusters having an average size less than about 1000 nm, the polymer composition having flame retardant properties.

57. (New) The process for making a flame retardant polymer composition of Claim 56, wherein the nano-cluster average size is less than about 100 nm.

58. (New) The process for making a flame retardant polymer composition of Claim 56, wherein the concentration of phosphorous-containing metal oxide is from about 0.1 to about 10 wt%.

59. (New) The process for making a flame retardant polymer composition of Claim 57, wherein the concentration of phosphorous-containing metal oxide is from about 0.1 to about 10 wt%.